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Study of Some Biochemical Parameters of the Drink Tchakpalo (Sugar Must) Sold in Cotonou Schools in the Republic of Benin

Aïkou N.[1*], R.A. Lapo[2], Coulibaly F. A.[3], Ahoyo A. T.[4], Ade S.[5], Moutawakilou G.[6], Aïkou N. L. M.[7], Aïkou A. N. E.[7], Zannou L.[7], Alkoare I.[8]

[1]National University of Sciences, Engineering and Mathematics/ Department of Human Biology/ Laboratory of Clinical Biochemistry and Medical Microbiology, BENIN
[2]Inter-state School of Science and Veterinary Medicine, Dakar Sénégal rocklapo[at]yahoo.fr;
[3]Pasteur Institute Abidjan Cote-d'ivoire, founzegue[at]yahoo.fr;
[4]Abomey Calavi University, Senior Lecturer / General Medical Microbiology and Hospital Hygiene Abomey Calavi Politechnical School / Human Biology Engineering, BENIN, taahoyo[at]yahoo.fr;
[5]Medicine Faculty, University of Parakou, Benin, sergeade[at]yahoo.fr
[6]University of Parakou / Assistant professor of clinical biochemistry, BENIN, gominanmoutawakilou[at]yahoo.fr
[7]Department of Clinical Biochemistry / Assistant, BENIN
[8]University of Parakou / Faculties of agronomic sciences / Plant production laboratory / Full professor / first vice rector of the University of Parakou, BENIN, ibalkoare[at]yahoo.fr

Corresponding author:
Dr AÏKOU Nicolas: National University of Sciences, Engineering and Mathematics Department of Human Biology Laboratory of Clinical Biochemistry and Medical Microbiology aikounicolas[at]yahoo.fr, nicolashoundjo[at]gmail.com, 04 BP 435
Tel: 00229 95059832

Abstract: ***The general objective is to check the nutritional value of the glucose level, calcium level, sodium level, potassium level, chlorine level and protein content in the drink of Tchakpalo (sweet must) in order to see what nutritional supplements these biochemical parameters provide to the body.***

Keywords: nutritional value, nutritional supplement, sweet must

1. Introduction

Beer is one of the most popular alcoholic beverages in the world, as it is produced in both developed and underdeveloped countries [1]. They meet physiological, psychological and sociological needs. They dissipate fatigue and depression, provide escape, lead to euphoria, facilitate communication and create celebration [2]. Given the importance of the market, the improvement in quality and quantity of the Tchakpalo could make the production of this home-made beer an activity that brings in foreign currency at the expense of imported beers. The preparation of the Tchakpalo is long and tiring, the total duration of the preparation of traditional products is ten to twelve days. It generally requires several sieving and cooking processes and therefore large quantities of wood. The product has a short shelf life (two days maximum) [6]. In many countries, its consumption is widespread and its production is an economic activity for many women (Burkina Faso, Cameroon, Benin, Ghana,). It is a mass-consumption product and more accessible than industrial and imported beers. However, in some countries, there is a downward trend in urban areas (loss of know-how and technological constraints). Tchakpalo is obtained by fermenting red millet and maize. The alcoholic degree is between 4.3° and 5.8° [3] varies according to the region and depends on the cooking time.

In addition, the sweet must intermediate product of Tchakpalo is a traditional non-alcoholic drink consumed in several African countries including Benin. Tchakpalo (sweet must) is an indigenous drink made in Benin from cereals (maize, millet and sorghum). It is consumed by schoolchildren, adults, pregnant women and children [4]. It is kept in canaries and drunk from glasses, goblets and gourds. One and a half liters of the sweet must drink is sold for 300fCFA in Benin. The aim of our work has therefore been to study some biochemical parameters of the Tchakpalo drink in schools in Cotonou in order to see if this drink can be consumed by everyone, both healthy and sick people. The general objective of this study was to verify the nutritional value of the glucose, calcium, sodium, potassium, chlorine and protein content of the Tchakpalo drink (sweet must) in order to see what nutritional supplement these biochemical parameters provide to the body.

2. Material and Methods

1. Work equipment

1.1 Biological material

The biological material consists of 100 samples of the sweet must drink taken from sterile 40mL bottles from Tchakpalo's female vendors in Cotonou schools.

The equipment used during our handling is:

- A refrigerator for the storage of reagents branded "**ELECTROLUX**".
- Ionograph apparatus (**Na+ Cl- K+)** brand "**EB lyte-921 F**".
- A "**TITANOX**" brand sterilizer
- A water bath at 37°C
- A spectrophotometer model "**AP 3000 M**".
- An "**EBA III**" brand centrifuge.
- Distilled water
- Glucose reagent (CYPRESS kit)
- Protein reagent (CYPRESS kit)
- The calcium reagent (CYPRESS kit)

2. Methodology

o **Taking samples**

The sampling was carried out on twenty (20) women vendors' wives from Tchakpalo repeatedly (5 times) within six (06) days at several locations such as Cadjèhoun, CEG Gbégamey, Agla, zongo, Godomey (Echangeur and Togoudo) and Calavi in areas of mass production in schools in Cotonou. For each production of Tchakpalo, the levy was taken from the ready-to-eat sweet must. Samples were taken in sterile 40 ml bottles, labelled and transported to the laboratory in an ice tray. A total of 100 samples of sweet must were studied. The samples were then centrifuged prior to the various tests.

Samples of the sweet must drink are then taken to the laboratory to be centrifuged at 3000 rpm before analysis.

- **Analytical phase**

The Na+ Cl- K+ ions; were determined by the ionographer device "EB lyte-921 F".

In order to determine the glucose, protein and calcium levels, three types of measurements were carried out.

The glucose level of sweet must is determined by a spectrophotometer model "AP 3000 M" by the end point method with the "Cypress diagnostic" kit.

3. Results

Concerning the glucose parameter **(figure 1)** the OD of the sweet must samples is proportional to the glucose level, 40% of the sweet must samples have a glucose level close to the average value of 3.2. For the protein parameter **(figure 2)**, the optical density of the sweet must samples is almost constant; 30% of the sweet must samples have a protein content of 3.68. However, the average for all the samples is 3.8, so the protein intake is not negligible.

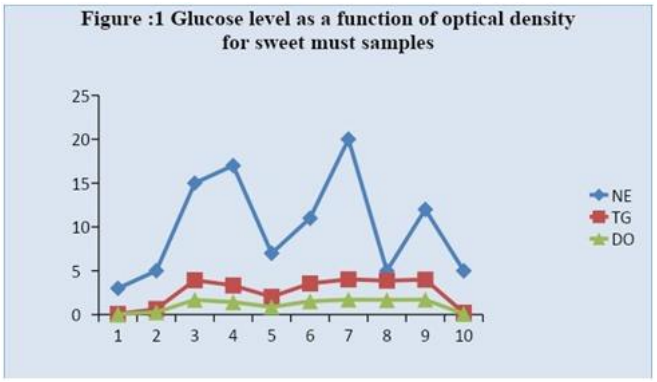


Figure :1 Glucose level as a function of optical density for sweet must samples

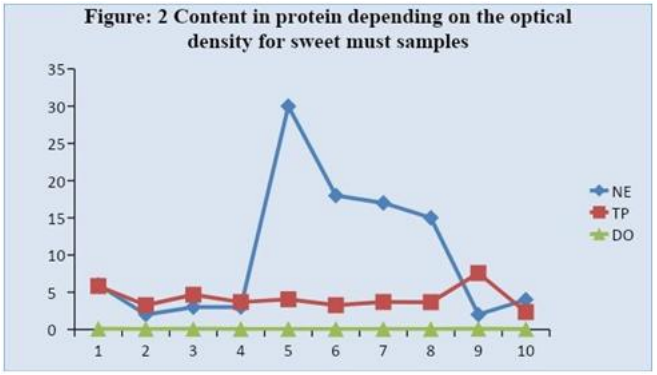


Figure: 2 Content in protein depending on the optical density for sweet must samples

With regard to the calcium parameter **(figure 3)**, the optical density of the samples of sweet must is almost constant; 25% of the samples of sweet must have a calcium content of 48.71; therefore the calcium intake is not negligible when the sweet must is consumed. For the chlorine parameter **(figure 4)**, 27% of the samples of the sweet must drink have a chlorine content of 0.045; therefore the chlorine intake is very low following consumption of the drink.

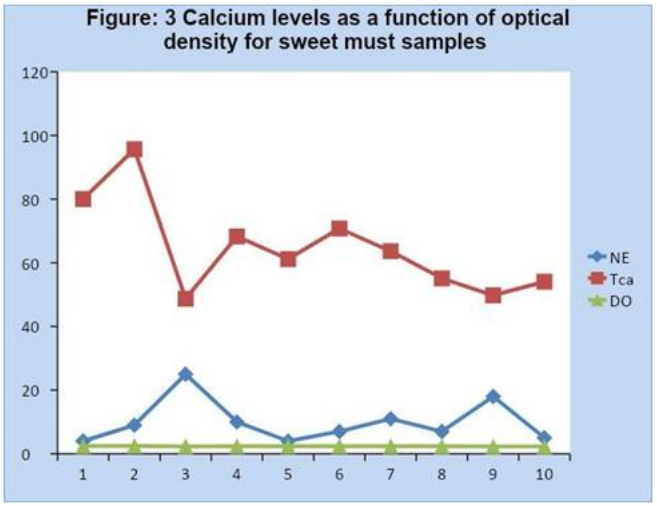
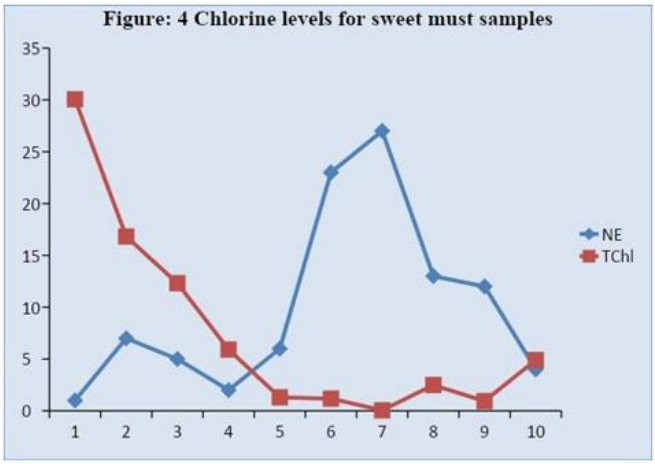
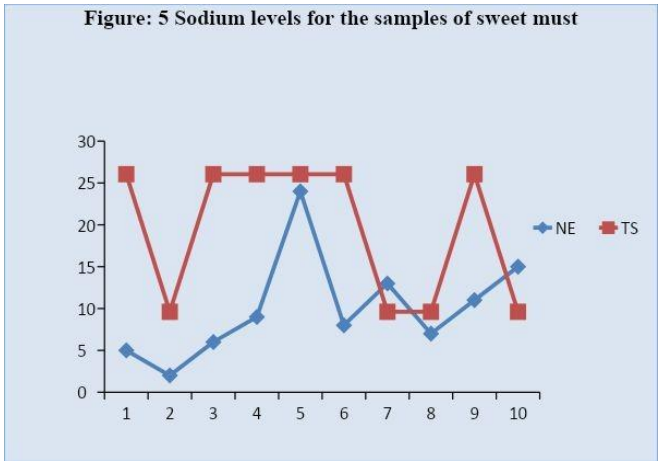
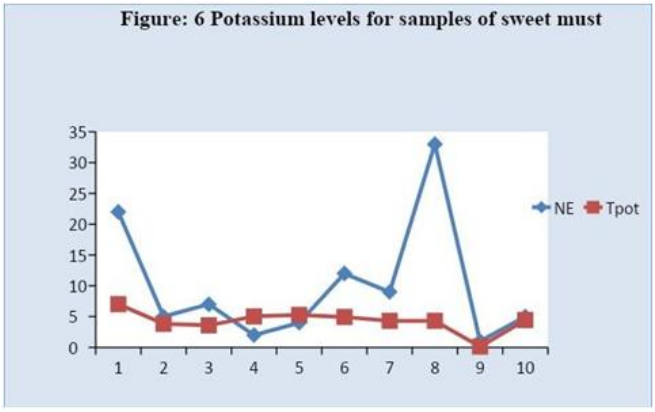


Figure: 3 Calcium levels as a function of optical density for sweet must samples

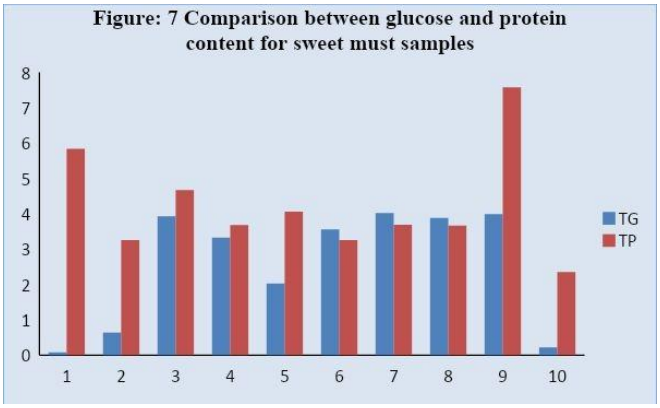


When the sodium parameter is taken **(figure 5)**, it can be seen that 63% of the sweet must samples have a sodium level of 26.05; therefore the sodium intake is not negligible following consumption of the sweet must drink. For the potassium parameter **(figure 6)** 33% of the samples of sweet must have a potassium level of 4.32; hence the potassium intake when consuming the drink is not negligible.

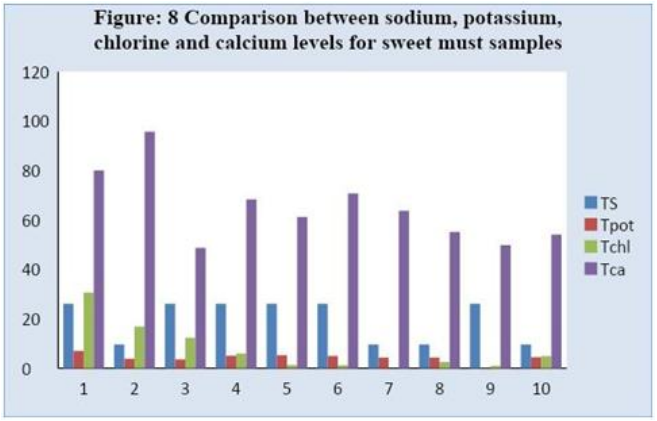




By comparing the glucose and protein parameters **(figure 7)**, it can be seen that the samples of sweet must have a protein content close to the average of 3.8; on the other hand, the samples of sweet must have a glucose level close to the average of 3.2; therefore the contribution of these two parameters in the drink is not negligible following consumption of the drink.



By comparing the parameters calcium, sodium, potassium and chlorine in the sweet must drink **(figure 8)**, it can be deduced that the calcium, sodium and potassium intakes are therefore not negligible and the chlorine intake is very low when drinking Tchakpalo (sweet must).



Analysis of the chemical properties of the drink of the must sugars (Table1)

The Na+ Cl- K+ ions were determined by the ionographer "**EB lyte-921 F**" with values of 19.4mmol/L, 7.5mmol/L and 4.3mEq/L respectively**.** Glucose, calcium and protein content of sweet must are determined by a model spectrophotometer "**AP 3000 M**" by the end point method with the "Cypress diagnostic" glucose, calcium and total protein kits with respective values: 3.2g/L; 64.71mg/L and 3.8g/L. Concerning the statistical analysis of the chemical properties, the data analysis was carried out with the ANOVA method with one and two factor(s) using the STATISTICA software (Stat., Soft, Inc., 1995) [7]. Statistical differences with a probability value of less than 0.05 ($P < 0.05$) are considered significant. When the probability value is greater than 0.05 ($P > 0.05$) the statistical differences are not significant.

Table 1: Some biochemical parameters of the sweet must drink

	TG (g/L)	TP (g/L)	Tca (mg/L)	Tchl (mmol/L)	TS (mmol/L)	Tpot (mEq/L)
	2 *X*± ó	2 *X*± ó	2 *X*± ó	2 *X*± ó	2 *X*± ó	2 *X*± ó
Sweet must samples	3, 2 ± 1, 22	3, 8 ± 0. 85	64, 7 ± 14, 7	7, 5 ± 9, 6	19, 4 ± 8, 48	4, 3 ± 1, 74

With NE: Number of samples**; Tpot:** Potassium content; **DO:** Optical density**; Tca:** Calcium content**; Tchl:** Chlorine content; **TS:** Sodium content; **TG:** Glucose content **and TP:** Protein content**.**

However, analysis of these results shows that the statistical differences in glucose, protein, calcium, chlorine, sodium and potassium levels of the sweet must beverage samples are not significant ($P > 0.05$) according to ANOVA and the Tukey multiple comparison test.

4. Discussion

The general objective of this work was to verify the nutritional value of the glucose, calcium, sodium, potassium, chlorine and protein content in the drink of Tchakpalo (sweet must) in order to see what additional nutritional supplement these biochemical parameters provide to the body.

Studies carried out on the few biochemical parameters of Tchakpalo drink in Cotonou schools have shown that out of one hundred samples of the sweet must drink, statistical analyses of the chemical properties showed that there is no significant difference [6].

From this study the intake of glucose, protein, calcium, sodium, and potassium levels are not negligible following consumption of the sweet must drink [1-2-3-4-5] and the intake of chlorine when drinking the sweet must drink is very low [7].

5. Conclusion

The study carried out on the sweet must drink has shown that the glucose level intake is 3.2 g or 54.4 kilojoules (KJ) or 12.8 kilocalories (Kcal); the protein content intake in quantity is not negligible and is 3.8 g or 64.6 KJ or 15.2 Kcal; the intake of the potassium, sodium and calcium content following consumption of the drink is not negligible and the intake of chlorine when drinking the sweet must drink is very low. These different carbohydrate, protein and ion contents show that the sweet mash drink is an energy drink. The study also shows that the drink of Tchakpalo (sweet must) should not be recommended for diabetics because of the high glucose levels in the drink; for hypertensive patients and for those with renal insufficiency due to sodium and potassium levels; and for patients with diabetes because of the drink's content of sodium and potassium. Advise this drink Tchakpalo (sweetened must) to all people with activities that require energy, as it is an energy drink.

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